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3GPP TS 22.121 V4.0.0 (2000-10)

Technical Specification

**3rd Generation Partnership Project;
Technical Specification Group Services and System Aspects
Service aspects;
The Virtual Home Environment
(Release 4)**



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Foreword

This Technical Specification (TS) has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

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1 Scope

The present document specifies the content of the stage one requirement for realisation of VHE.

Virtual Home Environment (VHE) is defined as a concept for personal service environment (PSE) portability across network boundaries and between terminals. The concept of the VHE is such that users are consistently presented with the same personalised features, User Interface customisation and services in whatever network and whatever terminal (within the capabilities of the terminal and the network), wherever the user may be located.

A key feature to support VHE is the ability to build services using a standardised application interface.

Requirements not applicable for R99 will be explicitly indicated.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

2.1 Normative references

- [1] GSM 01.04: "Digital cellular telecommunication system (Phase 2+); Abbreviations and acronyms".
- [2] GSM 22.057: "Digital cellular telecommunication system (Phase 2+); Mobile Execution Environment (MExE); Service description".
- [3] GSM 02.78: "Digital cellular telecommunication system (Phase 2+); Customised Applications for Mobile network Enhanced Logic (CAMEL); Service definition - Stage 1".
- [4] GSM 11.14: "Digital cellular telecommunication system (Phase 2+); Specification of the SIM Application Toolkit for the Subscriber Identity Module - Mobile Equipment; (SIM - ME) interface".
- [5] 3GPP TS 22.01: "Universal Mobile Telecommunications System (UMTS); Service Aspects; Service Principles".
- [6] 3GPP TS 22.05: "Universal Mobile Telecommunications System (UMTS); Services and Service Capabilities".
- [7] ITU-T Recommendation Q.1701: "Framework for IMT-2000 networks".
- [8] ITU-T Recommendation Q.1711: "Network Functional Model for IMT-2000".
- [9] 3GPP TS 22.00: "UMTS phase 1".
- [10] 3GPP TS 23.127 "Virtual Home Environment/Open Service Architecture".

2.2 Informative references

- [1] 3GPP TR 22.70: "Universal Mobile Telecommunications System (UMTS); Virtual Home Environment".

[2] World Wide Web Consortium Composite Capability/Preference Profiles (CC/PP): A user side framework for content negotiation (www.w3.org).

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

HE-VASP: Home Environment Value Added Service Provider. This is a VASP that has an agreement with the Home Environment to provide services.

Local Service: service, which can be exclusively provided in the current serving network by a Value added Service Provider.

Service Capabilities: bearers defined by parameters, and/or mechanisms needed to realise services. These are within networks and under network control.

Service Capability Feature: functionality offered by service capabilities that are accessible via the standardised application interface.

Services: services are made up of different service capability features.

Service Execution Environment: service execution environment is a platform on which an application or programme is authorised to perform a number of functionalities; examples of service execution environments are the user equipment, integrated circuit card and a network platform or any other server.

Applications / Clients: these are services, which are designed using service capability features.

Application Interface: standardised Interface used by application/clients to access service capability features.

Personal Service Environment: contains personalised information defining how subscribed services are provided and presented towards the user. The Personal Service Environment is defined in terms of one or more User Profiles.

Home Environment: responsible for overall provision of services to users.

User: is a logical entity, which uses UMTS services.

User Interface Profile: contains information to present the personalised user interface within the capabilities of the terminal and serving network.

User Services Profile: contains identification of subscriber services, their status and reference to service preferences.

User Profile: this is a label identifying a combination of one user interface profile, and one user services profile.

Value Added Service Provider: provides services other than basic telecommunications service for which additional charges may be incurred.

Virtual Home Environment: concept for personal service environment portability across network boundaries and between terminals.

Further UMTS related definitions are given in 3G TS 22.101.

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

API	Application Programming Interface
CAMEL	Customised Application For Mobile Network Enhanced Logic
CAP	Camel Application Part
CORBA	Common Object Request Broker Architecture
CSE	Camel Service Environment

FFS	For Further Study
GSN	GPRS Support Nodes
HE	Home Environment
HE-VASP	Home Environment Value Added Service Provider
HLR	Home Location Register
LCS	LoCation Services
MAP	Mobile Application Part
ME	Mobile Equipment
MExE	Mobile Execution Environment
MMI	Man Machine Interface
MS	Mobile Station
MSC	Mobile Switching Centre
OSA	Open Service Architecture
PLMN	Public Land Mobile Network
PSE	Personal Service Environment
SAT	SIM Application Tool-Kit
SIM	Subscriber Identity Module
SMS	Short Message Service
SSF	Service Switching Function
USIM	User Service Identity Module
USSD	Unstructured Supplementary Service Data
VASP	Value Added Service Provider
VHE	Virtual Home Environment

Further GSM related abbreviations are given in GSM 01.04. Further UMTS related abbreviations are given in UMTS TS 22.01.

4 General Description of the VHE

Virtual Home Environment (VHE) is defined as a concept for personal service environment portability across network boundaries and between terminals. The concept of the VHE is such that users are consistently presented with the same personalised features, User Interface customisation and services in whatever network and whatever terminal (within the capabilities of the terminal and network), where ever the user may be located.

The key requirements of the VHE are to provide a user with a personal service environment which consist of:

- personalised services;
- personalised User Interface (within the capabilities of terminals);
- consistent set of services from the user's perspective irrespective of access e.g. (fixed, mobile, wireless etc. Global service availability when roaming.

The standards supporting VHE requirements should be flexible enough such that VHE can be applicable to all types of future networks as well as providing a framework for the evolution of existing networks. Additionally the standards should have global significance so that user's can avail of their services irrespective of their geographical location. This implies that VHE standards should:

- provide a common access for services in future networks;
- enable the support of VHE by future networks;
- enable the creation of services;
- enable personal service environment to be recoverable (e.g in the case of loss/damage of user equipment).

Roles and components involved in realisation of VHE consist of the following also see figure 1:

- home environment;
- user identifiers;
- users;

- terminals (simultaneous activation of terminals providing the same service per single subscription is not allowed);
- serving networks;
- subscriptions;
- possibly value added service providers;
- personal service environment;
- user profiles.

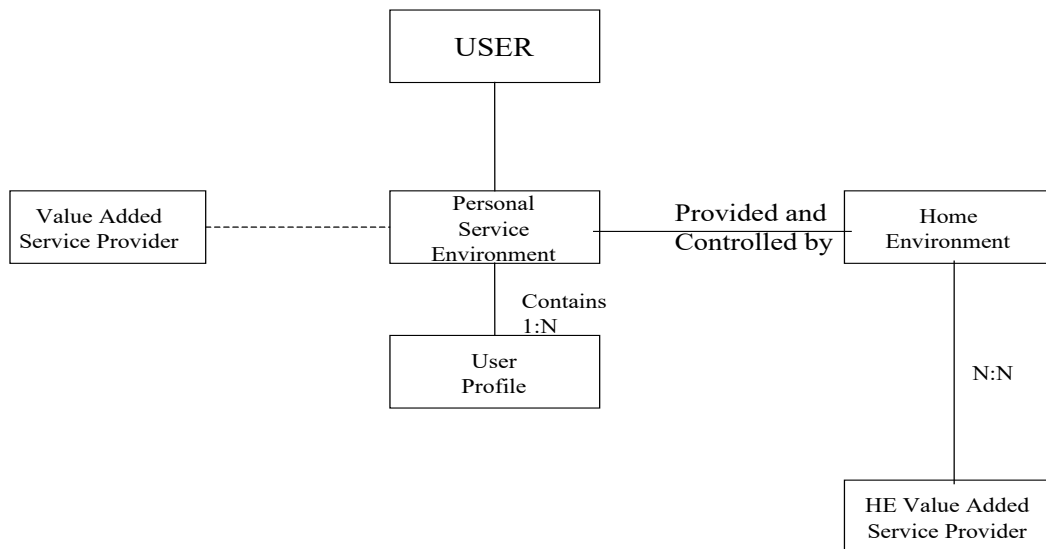


Figure 1: Service Provisioning From User's point of View

The Home Environment provides and controls services to the user in a consistent manner. The User's personal service environment is a combination of services and personalisation information (described in the user profile). The user may have a number of user profiles which enable her to manage communications according to different situations or needs, for example being at work, in the car or at home. Services provisioned to the user may allow or require personalisation by the user.

The Home Environment provides services to the user in a managed way, possibly by collaborating with HE-VASPs, but this is transparent to the user. The same service could be provided by more than one HE-VASP and HE-VASP can provide more than one service.

Additionally, but not subject to standardisation, the user may access services directly from Value Added Service Providers. The Home Environment does not manage services obtained directly from VASPs. A mechanism may be provided which allows the user to automate access to those services obtained directly from VASPs and personalise those services. However such a mechanism is outside of the scope of the present document.

Services in from release 2000 and beyond can be created from enhanced version of existing service capabilities. (e.g CAMEL, MExE, OSA and SAT) plus any new service capabilities with possible addition of IP capabilities.

The following options shall be available in the standards to enable service delivery in the new architecture:

- capability toolkits enhanced to control IP multimedia services, which will allow applications to be deployed in a vendor independent manner
- the VHE concept that enables toolkits not standardised by 3GPP to be used to deliver services (e.g. adoption of IP recommendations to facilitate the IP applications)

- mechanisms which allow the network to understand the limitations of the terminal and thereby take appropriate actions.

5 Framework for Services

The implementation of VHE in UMTS release 00 shall support VHE in UMTS release 99 services as applied in 3GPP TS 22.121 and new services built by service capability features. Later UMTS developments will provide support for a wider range of services in later releases.

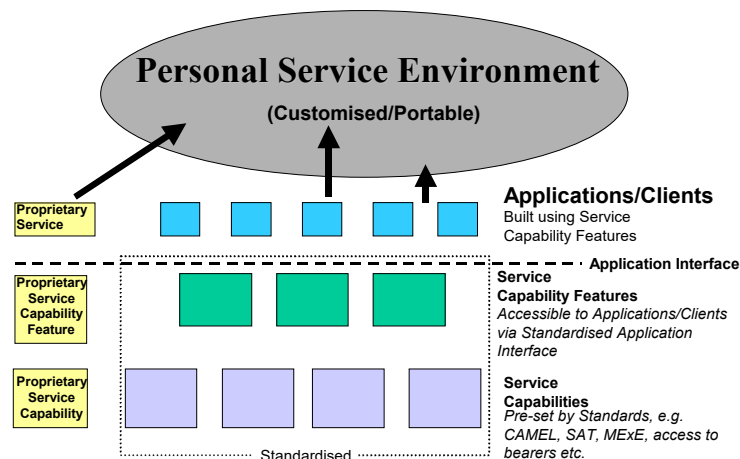


Figure 2: Framework for Services

The goal of standardisation in UMTS with respect to services is to provide a framework within which services can be created based on standardised service capability features see figures 2 and 3. UMTS services will generally not rely on the traditional detailed service engineering (evident for supplementary services in second-generation systems), but instead provides services using generic toolkits.

Services can be built using service capability features ([1], [2], [3], [4], [9], [10]), which are accessed via a standardised interface. An example of how a service can be built on service capability features could be "call to nearest restaurant", this will make use of call set-up, authorisation, location and database lookup.

The available service capability features are visible to applications through the standardised application interface. The application interface can be realised in such a way that applications may or may not have knowledge of the underlying mechanisms used.

For example, in the case where the applications have knowledge of the underlying mechanisms as an example, the User Location service capability features can be provided by a location server (e.g. HLR, LCS) and in the case where application may not have knowledge of underlying mechanisms the application will only see a single User Location service capability feature and does not know which location server provides it.

The standardised application interface shall be:

- Independent of vendor specific solutions;
- Independent of programming languages, operating systems etc used in the service capabilities;
- Secure scalable and extensible.
- independent of the location where service capabilities are implemented;
- independent of supported service capabilities in the network; and

- Access to Service Capability Features shall be realised using modern state of the art access technologies, e.g. distributed object oriented technique might be considered.

5.1 Ways to realise services

The information contained in this clause is only to aid understanding and is not an extensive list.

Figure 3 illustrates how the concept of VHE makes use of the standardised application interface and how that fits to the service capability features and service capabilities for release 99. Note that the Service Capabilities (SCx) shown below are representatives of the different possible capabilities. It is not to be implied as the agreed architecture as this is a stage 2 issue.

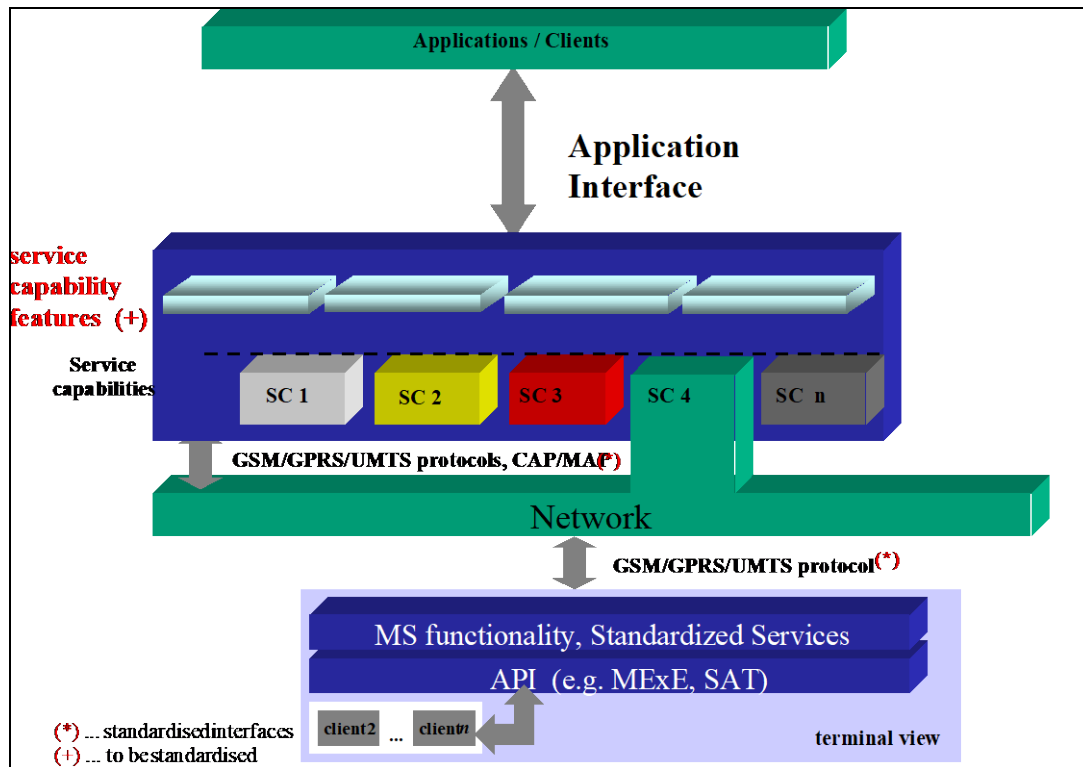


Figure 3: Possible realisation of Framework for Services

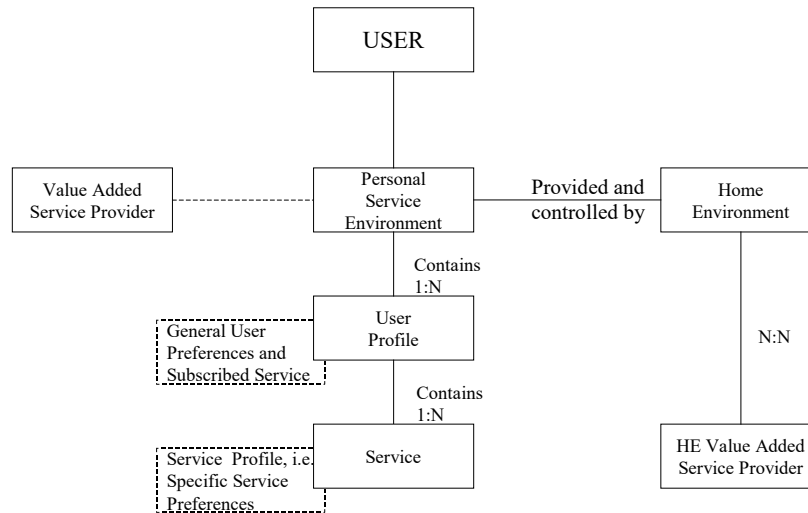
STANDARDISED SERVICES (Supplementary Services, Tele-Services, etc.) are implemented on existing GSM/UMTS entities (e.g. HLR, MSC/VLR and terminal) on a vendor specific basis, using standardised interfaces (MAP, etc.) for service communication (e.g. downloading of service data). Availability and maintenance of these Services is also vendor dependent.

OPERATOR SPECIFIC SERVICES (OSS) are not standardised and could be implemented at the GSM/UMTS entities (e.g. HLR) on a vendor specific basis or using GSM ph 2+ mechanisms (CAMEL, SAT, MExE). These tool-kits use standardised interfaces to the underlying network (e.g. CAP, MAP) or use GSM Bearers to transport applications and data, for example, from the MExE service environment of SAT server to the MS/SIM. The implementation of these operator specific services on the different platforms (CSE, MExE service environment /SAT Server, MSs) is done in a completely vendor specific way and uses only proprietary interfaces.

Other **APPLICATIONS** are like OSS not standardised. These applications will be implemented using standardised interfaces to the Service Capabilities (Bearers, Mechanisms). The functionality offered by the different Service Capabilities are defined by Service Capability Features. These Service Capability Features will be standardised and can be used by the application designers to build their applications.

Within the terminals Service Capabilities are accessible via APIs, for example, MExE and SAT APIs, i.e. there will be no service capability features within the terminal.

The terminal can communicate, using GSM/UMTS bearers, with applications in the network via the service capability features which may be optionally realised for MExE service environment and SAT-servers.



The set of services from the Users point of view

Figure 4

6 User Requirements of VHE

The user shall have the possibility to manage services as well as the appearance of the services. It shall be possible for the user to:

- personalise services;
- Personalised User Interface (within the capabilities of terminals);
- access services from any network or terminal subject to network capabilities, terminal capabilities and any restrictions imposed by the home environment;
- use services in a consistent manner irrespective of serving network and terminal, within the technical limitations;
- access new services in the Home Environment;
- modify a user profile(for example to include new services) from any location;
- activate or deactivate user services;
- discover which local services are available;
- access local services in a secure manner;
- interrogate current user service and user interface settings;
- select a particular User Profile;
- indicate (on a session by session basis if necessary) to which subscription charges are to be applied to;
- recover MS resident User Profile information to protect against loss or damage of user equipment.

Be aware of limitations of services, which may result from different terminals and or serving network capabilities.

6.1 Personal Service Environment

The Personal Service Environment describes how the user wishes to manage and interact with their communications services. The PSE is a combination of a list of subscriptions (detailing provisioned services), preferences associated

with those services, terminal interface preferences and other information related to the user's experience of the system. Within the PSE the user can manage multiple subscriptions e.g. both business and personal, multiple terminal types and express location and temporal preferences. The Personal Service Environment is defined in terms of one or more User Profiles.

6.1.1 User Profiles

A combination of different preferences is described by a User Profile. The user can define one or more User Profiles according to their needs.

Each User Profile consists of two kinds of information:

1) User data profile.

The User Profile consists of the following type of information:

- menu settings, e.g. menu items shown, menu structure, the placement of icons;
- terminal settings, e.g. ringing tone and volume, font type and size, screen and text colour, language, content types and sizes accepted;
- Network related preferences e.g. language used for announcements. (editor's note: for clarification)

2) User Service Profile

The User Service Profile consist of the following type of information:

- A list of services subscribed to
- References to Service Preferences for each of the services subscribed to if applicable. Service Preferences could be information such as redirection numbers, redirection conditions, caller screening lists, time-of-day variations etc;
- Service status (active/deactive)

The user may define one or more User Data Profiles and many User Services Profiles, but a given User Profile consists of a single combination of these. In this way a user could for example have a different User Profile to suit each of the three different terminals she owns. The User Services Profile is the same in each case but the User Data Profile is different to suit the display capabilities of each terminal. User Profiles could also exist which use the same User Data Profile but different User Services Profiles. This might simply imply that business calls are forwarded to an answering service when the user leaves the office because a new User Profile is now active.

Where the user has more than one User Profile the activation of a particular one could be done in the following ways:

- *Statically*: the user explicit selects one of the User Profiles as the active one;
- *Dynamically*: the appropriate User Profile is selected automatically based upon some criteria such as time of day, location, terminal used or many other possibilities.

Each User Profile must have a uniquely addressable identity.

For UMTS Release '99 the information in the User Profiles enables the service capabilities SAT, MExE and CAMEL toolkits in R'99 and existing GSM services to support the user's PSE across network boundaries and between different terminals.

It shall be possible for the service capabilities to access the user profile information from the home environment if appropriate.

6.1.2 User Profiles and Multiple Subscriptions

The user may wish to manage more than one subscription in their PSE. This would allow them to have a single USIM but specify different preferences for the services provisioned in each subscription. In this case the User Services Profile will need to detail all of the services provided per subscription and provide references to the service preferences for each service. When initiating a chargeable event the user will need to indicate which subscription the charges should be applied to.

6.1.3 Management of the user profile

Figure 5 shows a data model for a user profile, which consist of user service profile and user data profile.

Some terminal related data are contained within the data profile such as menu settings and terminal settings. This data profile are stored in the terminal and/or USIM and may be made available to application in the terminal and USIM according to their respective security models conforming to the levels of authorisation of these tools. Detailed definition of terminal related user data profile is within terminal capabilities group such as MExE, WAP or USAT.

Some network-related data is contained within the data profile such as language used for announcements, encryption, security and authentication. Some user data, which are to be used by more than one application need to have standardised format and schematics. User service profile is made available to the network and the terminal. Service profiles relating to terminals are defined under terminal capabilities TS xx.xx. Service profiles relating to network are defined under network capabilities TS xx.xx.

Service profile is generally not subject to standardisation as this are changeable, however it is necessary for the user profile to include a minimum set of standardised data such as user id.

The user and the home environment may modify the user's characterisation of the Personal Service Environment as described in the User Profiles at any time, and changes become effective at the earliest possible opportunity. The home environment shall be able to update distributed User Profiles to reflect any user or home environment modification of the user's Personal Service Environment. A synchronisation mechanism to update the user profile when it is distributed shall be supported, to ensure that components of the user profile are consistent, wherever they are located.

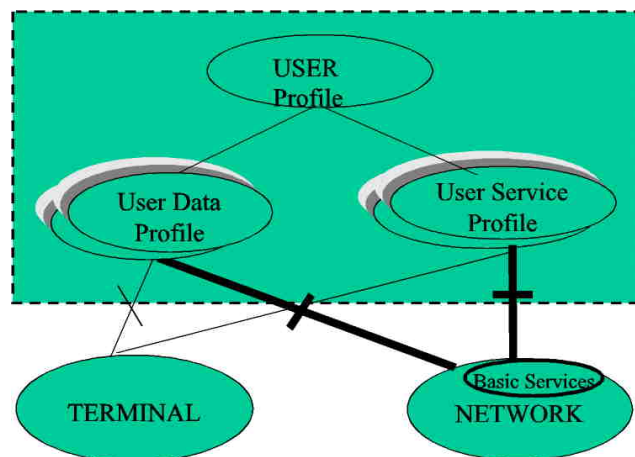


Figure 5 Data Model for a User Profile

6.1.4 Location of User Profiles

The User Profiles may be partly stored in the Mobile Station (the SIM or the ME), and/or the home environment or elsewhere (which is outside the scope of standardisation). The information in User Services Profiles is distributed between the home environment and the MS. In the event of loss/damage of mobile station (SIM or ME), the User Profiles must be fully recoverable and be used to reconfigure a new mobile station.

The user profile information in the Home Environment should be kept constant with any changes in Mobile Station.

User profile associated with external VASP is not stored within the Mobile Station or HE, this may be stored with the external VASP, details of this is outside 3GPP scope. There is no requirement for backup and recovery of this data.

Some aspects of the User Profiles such as aspects related to terminal configuration, must be stored in a standardised format to support VHE.

NOTE: To ensure that User Profiles are applicable to as wide a community of terminal and network types as possible, existing work on this topic in other standards fora should be considered. One possibility is the work of the World Wide Web Consortium on the Composite Capability/Preference Profile [2].

Editors note: There will be levels of authorisation

6.1.5 Requirements for Standardisation

To facilitate the provision of PSE and User Profiles the standard shall allow a minimum set of requirements that can be used to identify a user. This will consist of:

- User ID;
- HE ID;
- Equipment ID (IMEI);
- Basic set of services e.g emergency call, voice call and text call.

7 Home Environment Requirements for VHE Provision

It shall be possible for the home environment to:

- control access to services depending on the location of the user, and serving network;
- control access to services on a per user basis e.g subject to subscription;
- control access to services depending on available service capabilities in the serving network, and terminals;
- manage service delivery based on for example end to end capabilities and/or user preferences;
- request version of specific services supported in serving network and terminal;
- request details (e.g. protocol versions and API versions) of available service capabilities supported in the serving network, and terminals;
- define the scope for management of services by the user, for services provided by the HE, supported by a standardised method for accessing uniquely addressable user profiles;
- handle charging for services (as defined in clause 11);
- inform the serving network of the type of charging (i.e. prepaid or/and postpaid) for any required service;
- inform the serving network of the threshold set for a given service required by the user and charged on a prepaid account;
- inform the serving network how to manage a service for which the threshold has been reached;
- manage the prepaid accounts (e.g. increase, decrease the credit, or pass the information to any application which manages the credit);
- deploy services to users or groups of users;
- manage provision of services to users or groups of users.

8 Serving Network Requirements for VHE Provision

The serving network should not need to be aware of the services offered via the home environment.

The user/home environment may request capabilities which are necessary to support home environment services.

It shall be possible for the serving network to perform the following:

- the serving network shall support user access to services in the home environment, supported by a standardised method for accessing uniquely addressable user profiles;
- the serving network shall provide the necessary service capabilities to support the services from the home environment as far as possible;
- dynamically provide information on the available service capabilities in the serving network;
- provide transparent communication between clients and servers in terminals and networks;
- request the charging information (type of charging, threshold for prepaid services and behaviour if the threshold is reached) for any service possibly required by the user;
- handle the call according to the instructions received by the home environment regarding charging activities;
- inform the home environment of the chargeable events (e.g. send CDRs, ...).

9 VASP Relationship to VHE

The user may access services directly from Value Added Service Providers. Services obtained directly from VASPs are not managed by the Home Environment and therefore are not part of the VHE offered by the Home Environment. A mechanism should be provided which allows the user to automate access to those services obtained directly from VASPs and personalise those services. However such a mechanism is outside of the scope of the present document.

There may be some information, which is shared between the Home Environment and the HE-VASP (for example current capabilities).

The Home Environment may grant the HE-VASP access to standardised service capabilities in order to allow the development and deployment of services on behalf of the Home Environment.

There are no VASP requirements to support VHE. It is noted that with mechanisms such as CC/PP, VASP's may indirectly implement VHE stored user profiles during Capability Negotiation (e.g. using HTTP next generation), however this is outside the scope of standardisation.

10 Applicability of toolkits

This clause reviews the applicability of the existing toolkits from Release 99.

Release 2000 shall incorporate improvements for VHE to support IP multimedia services, e.g. improvements to service capability features, service capability servers, user profile etc. This will give operators and 3rd party service developers the opportunity to create IP multimedia applications and services for Release 2000 networks.

Reuse of already implemented applications and services are also important. CAMEL, MExE, USAT and OSA, are service capabilities in the VHE for Release 99 and will also be supported in Release 2000.

VHE Release 2000 shall include new (if required) and enhanced service capabilities to support IP multimedia services.

10.1 CAMEL

Release 2000 will be able to use CAMEL improvements following Release 99 (e.g. Phase 4), plus previous versions.cf TS22.078

Vhe requirements on CAMEL:

- Users shall be able to use their existing CAMEL services in a consistent manner with both CS services and IP multimedia services. This shall occur in a transparent fashion and the user need not be aware of whether the service is either circuit switched or packet switched. The same look and feel of the service shall be maintained.
- Operators shall be able to reuse their existing CAMEL services for IP multimedia.

10.2 MExE

Release 2000 will be able to use MExE improvements following Release 99 plus previous versions of TS22.057

The requirement on MExE:

There needs to be harmonisation between the MExE user profile and VHE user profile. This could also require a mechanism to interrogate the terminal about its user terminal profile.

10.3 USAT

Release 2000 will be able to use USAT improvements following Release 99 plus previous versions of TS22.0XX

The requirement on USAT:

There needs to be harmonisation between the USAT user profile and VHE user profile.

USAT terminals interact with the USIM using capability negotiation, and it shall be possible to continue usage of the capability negotiation for IP multimedia services.

10.4 Open Service Architecture (OSA)

Release 2000 will be able to use OSA.

VHE requirement on OSA:

11 Service execution environment

The following service execution environments shall be standardised and could be used to provide a VHE for the user:

- user equipment execution environment;
- IC card execution environment;
- network execution environment not required for R99.

For UMTS release 99 one or more of the following shall provide the execution environments:

- MExE;
- SIM Application Tool kit (SAT);
- CAMEL.

12 Charging requirements

Services, which are provided as part of the VHE, may be subject to charge at the discretion of the home environment

There are several forms of charging which shall be available to the home environment. It shall be possible for the home environment to charge in the following instances:

subscription:

- the user's registration to use services may be subject to charge.

service transfer:

- the transfer of services and/or information to the user MS or USIM may be subject to charge.

service upgrading:

- the upgrading of previously transferred services to the user's MS or USIM may be subject to charge (automated upgrading of services may be subject to a different charge).

service usage:

- the usage of services by a user may be subject to a charge.

roaming:

- the usage of VHE services when roaming may be subject to additional charges.

Refer to UMTS 22.15 for further details.

Other charging requirements may be identified and are for FFS.

13 Security requirements

The mechanisms supporting VHE shall maintain a secure environment for the user and home environment.

The specific security requirements are FFS.

Annex A (informative): Service examples to be considered in VHE

The following table shows the service examples to be considered in VHE.

Table A.1

Benchmark Services	Abb	Priority
Abbreviated Dialling	ABD	A
Account Card Calling	ACC	B
Automatic Alternative Billing	AAB	A
Call Distribution	CD	A
Call Forwarding	CF	A
Call Hold	CH	A
Call Rerouting Distribution	CRD	A
Call Transfer	TRA	A
Call Waiting	CW	A
Completion of Call to Busy Subscriber	CCBS	A
Conference Calling	CON	A
Credit Card Calling	CCC	B
Destination Call Routing	DCR	A
Follow-Me Diversion	FMD	A
Freephone	FPH	A
Global Virtual Network Service	GVNS	A
Hot Line	HOT	A
International Telecommunication Charge Card	ITCC	B
Internetwork Freephone	IFPH	A
Internetwork Mass Calling	IMAS	A
Internetwork Premium Rate	IPRM	A
Internetwork Televoting	IVOT	A
Malicious Call Identification	MCID	A
Mass Calling	MAS	A
Message store and forward	MSF	A
Multimedia	MMD	B
Originating Call Screening	OCS	A
Premium Rate	PRM	A
Security Screening	SEC	A
Selective Call Forward on Busy / Dont' answer	SCF	A
Split Charging	SPL	A
Televoting	VOT	A
Terminating Call Screening	TCS	A
Terminating Key Code Protection	TCKP	B
Universal Access Number	UAN	B
Universal Personal Telecommunication	UPT	A
User-Defined Routing	UDR	B (FFS)
Virtual Private Network	VPN	A

Benchmark services listed above could be realised by service capability features.

Annex B (informative): Change history

TSG SA#	SA Doc.	SA1 Doc	Spec	CR	Rev	Rel	Cat	Subject/Comment	Old	New
SA#04			22.121							3.0.0
SP-05	SP-99442	S1-99809	22.121	002		R99	B	Virtual Home Environment.	3.0.0	3.1.0
SP-05	SP-99442	S1-99845	22.121	003		R99	B	Addition of IP4 Addressing	3.0.0	3.1.0
SP-05	SP-99442	S1-99535	22.121	004		R99	B	Charging capabilities	3.0.0	3.1.0
SP-07	SP-000067	S1-000107	22.121	005		R99	F	Clarification of service capabilities	3.1.0	3.2.0
SP-07	SP-000067	S1-000156	22.121	006		R99	C	Information Transfer service capability feature	3.1.0	3.2.0
SP-08	SP-000204	S1-000267	22.121	007		R99	F	Modification of section 10.2.6 on reducing the scope of the VHE/OSA requirements	3.2.0	3.3.0
SP-08	SP-000204	S1-000283	22.121	008		R99	F	Removal of section 10.2.3 Address Translation SCF	3.2.0	3.3.0
SP-08	SP-000204	S1-000285	22.121	009		R99	F	Modification of section 10.2.9 to reduce scope of User Profile Management service capabilities	3.2.0	3.3.0
SP-08	SP-000204	S1-000334	22.121	010		R99	F	Alignment of VHE Stage 1 top VHE/OSA Stage 2 and stage 3	3.2.0	3.3.0
SP-09	SP-000387	S1-000566	22.121	011		R4	C	VHE in R00 User Profile	3.3.0	4.0.0
SP-09	SP-000387	S1-000565	22.121	012		R4	C	VHE in R00	3.3.0	4.0.0
SP-09	SP-000381	S1-000640	22.121	013		R4	D	Change of MExE name	3.3.0	4.0.0
SP-09	SP-000387	S1-000564	22.121	014		R4	D	Realisation of Application interface	3.3.0	4.0.0
SP-09	SP-000387	S1-000569	22.121	015		R4	B	Synchronisation of distributed user profiles	3.3.0	4.0.0
SP-09	SP-000387	S1-000570	22.121	016		R4	B	Uniquely addressable user profiles	3.3.0	4.0.0
SP-09	SP-000387	S1-000571	22.121	017		R4	D	VASP indirect support of VHE	3.3.0	4.0.0